

Tuberculosis Survey among the Employees of Santiago, Chile*

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THROUGH the efforts of the then Minister of Social Welfare, Dr. E. Cruz Coke, the Preventive Medicine Law was passed in 1938.

This is an official compulsory health insurance for private employees. It covers a middle class group made up of employees in commerce and the professions whose duties are chiefly intellectual and who receive their remuneration from private capital but are not covered by Labourers Insurance.

The operation of the Law is made possible by a 2 per cent tax on salaries, shared equally by employee and employer. The law provides for the annual physical examination of employees and free treatment for those who are found to have tuberculosis, syphilis, or circulatory disease in a curable form.

Offices and a special medical staff have been provided for carrying on examinations and treatment. The staff includes a group of internists, who take the history and make the general physical examination of the employee; a laboratory group; x-ray group; and specialists in tuberculosis, syphilis, and circulatory diseases. The employee has a routine history, physical examination, Wassermann and Kahn blood tests, and fluoroscopic examination of the

chest. If he shows signs of tuberculosis, syphilis, or a circulatory disease, he is transferred to the specialist for a more complete examination. A special effort is made to detect tuberculosis and, although fluoroscopy is used, there is no hesitancy in having a roentgenogram if there is any suspicion of a lesion. In fact, of all employees examined 30 per cent had chest plates taken.

In the first two and a half years of the Law's operation in Santiago, 68,854 persons were enrolled and insured. Of these, 25,556 were given a physical examination. Ages ranged from 16 to 65 years, and 75 per cent were men. Of the 25,566, 899, or 3.51 per cent, were found to have lesions of active tuberculosis, and 1,113, or 4.35 per cent, had signs of residual tuberculosis.

In Table 1 the group of employees examined is distributed according to age and sex and the number and percentage of those with active lesions is shown. The curve reaches its peak in the age group 20-29 and then descends rapidly through the upper age groups. If we compare this curve with our general tuberculosis mortality curve by ages, we see that their peaks coincide at the same age, but while the morbidity curve decreases rapidly, the mortality curve drops more slowly and, in fact, remains almost at the same level. We think that tuberculosis mortality after the age of 40 is due in great part to chronic tuberculosis incompatible

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TABLE 1
Employees Examined by Age, Sex and Active Tuberculosis

Age	Examined			Tuberculous			Percentages		
	Men	Women	Total	Men	Women	Total	Men	Women	Total
16-20	966	503	1,469	43	17	60	4.45	3.41	4.08
20-29	7,075	3,638	10,713	316	198	514	4.47	5.45	4.79
30-39	5,854	1,768	7,622	151	59	220	2.75	3.32	2.89
40-49	3,238	475	3,713	68	11	79	2.11	2.32	2.13
50 and over	1,913	136	2,049	16	0	16	0.84	0.0	0.78
Total	19,046	6,520	25,566	604	285	889	3.17	4.37	3.51

with an active life. Those individuals whom we examined were active workers with perhaps less chronic tuberculosis than the general population; hence, the apparent discrepancy between our curves of morbidity and mortality.

In contradistinction to our findings the tuberculosis mortality rate curve of white North Americans ascends progressively with age. Manuel Abreu found the same condition in the survey which he made of employees in Brazil in which the proportion with active tuberculosis lesions increased with age.

This difference between the Chilean curves of mortality and morbidity and those of other countries may indicate that we are passing through an epidemiological phase of maximum infection in which the disease has not yet shown a tendency to decrease spontaneously.

With regard to sex there is noted a higher morbidity among females during the reproductive period. Probably the phenomena of the sexual life of the

woman, such as menstruation and pregnancy bring about modifications in the defense mechanisms against infection.

The economic situation of this group can only be studied indirectly, that is, by grouping all private employees of Santiago according to daily wage, and then comparing the percentages of the 899 cases in each of these income divisions. This is shown in Table 2.

U. C. D. is the amount of money received per person per day. It is obtained by dividing the monthly income by 30, and that amount in turn by the number of individuals in the family.

If the income has a definite influence on morbidity rates we should expect to find these rates higher among the lower income groups. This, however, is not the case and, as we note in the above Table 2, there is a higher proportion of cases among those receiving more income per capita. Forty-three per cent of the cases were in the higher income group which made up only 23 per cent of the group studied.

Since these observations contradict our belief that the incidence of tuberculosis is influenced by the economic factor, it is necessary to make a more detailed study of a larger group of people than those included in this particular work. In order to obtain a more complete picture in Table 3 we have divided the provinces of Chile into groups according to the average salaries paid during the year 1939. In these

TABLE 2
Percentage of 889 Cases in Each Economic Group

U.C.D. (pesos)	Per cent of Active Cases	Per cent of Employees of Santiago
Less than 4.10	16.1	17.3
4.10-10.40	41.3	59.5
10.50-20.80	32.0	15.6
20.80 and over	10.6	8.6
Total	100.0	100.0

U.C.D. = Average daily salary per household member.
One Chilean peso is equal to \$0.03

TABLE 3

Provinces of Chile according to Average Salary Paid

<i>Weekly Salary (Dollars)</i>	<i>Provinces</i>	<i>Average Mortality Rate from Tubercu- losis (1937-1938)</i>	<i>Average Infant Mortality Rate (1937-1938)</i>
More than \$3.00	Magallanes, Coquimbo, Atacama, O'Higgins	253.5	188.5
From \$2.28 to \$2.97	Antofagasta, Tarapaca, Santiago, Valparaiso, Malleco, Aysen	271.4	206.6
From \$1.86 to \$2.25	Cautin, Colchagua, Aconcagua, Maule, Concepcion, Arauco, Bio-bio, y Curico	197.0	261.6
Less than \$1.86	Linares, Valdivia, Talca, Nuble, Llan- quihue, y Chiloe	190.0	271.8

groups of provinces we have obtained the tuberculosis mortality rates. Infant mortality rates, since they are our best statistical indication of economic status, have also been included. The highest infant mortality rates are in those provinces with the lowest income. The tuberculosis mortality rates, however, as in the previous table, are higher in those provinces where economic conditions are better.

It is interesting to note that Abreu in a similar study of municipal employees in Brazil found the same condition as in Chile with a higher percentage of active cases among the upper income groups. This is illustrated in Table 4.

TABLE 4

*Tuberculosis among Municipal Employees in
Brazil Classified according to Salary
(From Dr. Manoel de Abreu)*

<i>Monthly Salary (dollars)</i>	<i>Per cent of Active Tuberculosis</i>
\$17.75	2.38
\$31.50	3.00
\$45.00	2.07
\$60.00	4.82
\$60.20 and over	3.28

From these observations we are inclined to conclude that tuberculosis morbidity is not influenced by financial income in Chile. Probably the idea

that tuberculosis is an economic disease is due to the fact that the prognosis varies directly with the economic status of the patient.

TABLE 5

Per cent of Healed Classified by Salary

<i>U.C.D. (pesos)</i>	<i>Per cent of Healed</i>
Less than 4.10	52.4
4.10 to 10.40	66.5
10.50 to 20.80	68.2
20.90 and over	76.2

In order to determine the relationship of economic status and response to treatment, we have divided the persons treated into two groups, those who showed a favorable response, and those who showed no improvement. Table 5 gives the percentage of favorable responses to treatment in each of the various income per person per day groups, and illustrates clearly the higher number of cures among the upper income patients.

From these observations we are inclined to think that many individuals of good economic status having tuberculosis lesions without symptoms are cured spontaneously while many of those whose standard of living is lower become progressively worse. (Logically in this survey in which the majority of the lesions discovered are producing no

symptoms, the percentage of active lesions does not vary with the economic status of the groups examined.)

Unfortunately, the Preventive Medicine Law does not provide for the examination of family contacts, and for this reason it is impossible for us to investigate the relationship of economic status to communicability. It is only possible for us to group the individuals studied according to diagnosis and then compare these groups with reference to history of contact.

In Table 6 we have considered the individuals to have a history of contact if in their families there was an active case of tuberculosis under the care of a physician or a death from tuberculosis in recent years. This analysis demonstrates the importance of the contact factor in the spread of the disease. Attention is called to the fact that 16.7 per cent of those found with active lesions gave a positive history of contact, while only 0.9 per cent of those with no lesions gave such a history. This figure is similar to that obtained by us in the study of a small group of families of patients hospitalized for tuberculosis, in which we found 23 per cent of family contacts with active asymptomatic lesions. Professor Sayé in a recent investigation in Chile found that 22 per cent of individuals in familial contact with open cases of tuberculosis showed active lesions. (This high figure demonstrates the im-

portance of carrying antituberculosis activities to the family of the patient.)

TABLE 6

History of Exposure to Open Cases

<i>Diagnosis</i>	<i>Persons Examined</i>	<i>Per cent with Contact History</i>
Healthy	20,351	0.9
Residual Tuberculosis	1,316	9.1
Active Tuberculosis (Minimal and Moderately Advanced)	645	16.3
Far Advanced Tuberculosis	36	25.7

Residual tuberculosis is lesions without clinical significance and so these persons were not included among the tuberculous cases in Table 1.

The difference in the number of persons examined between Table 1 and Table 6 can be explained because we could not find any reference about exposure in 208 of the patients and in 3,000 of those classified as healthy, residual or not.

From Table 6 it is easy to see how much more important is the contact factor than the economic factor in the prevalence of tuberculosis in Chile. Unfortunately, tuberculosis has been looked upon as an economic disease, and for this reason the problem has been taken up by politicians and has been attacked chiefly by the economist rather than the epidemiologist.

Of the 889 individuals diagnosed as having active tuberculosis it is possible at this time to present figures on 461 closed cases. Of these 461, the first diagnosis was minimal lesion 178, moderately advanced 196, and far advanced 87. In Table 7, these are classified according to their condition at the time of discharge. The more advanced

TABLE 7

Stage at Time of Discharge Classified according to First Diagnosis

<i>Status at Discharge</i>	<i>First Diagnosis</i>		
	<i>Minimal</i>	<i>Moderately Advanced</i>	<i>Far Advanced</i>
Cured	162	122	4
Improved	11	30	11
Unchanged	2	23	45
Worse	3	21	27
Total	178	196	87

Deaths are not included because those who become worse or are unchanged after a reasonable period of time are discharged, and the Service does not know anything more about them.

The people classified as improved are those considered cured but without the gastric lavage which can prove it.

the disease at the time of discovery, the less favorable was the outcome.

In Table 8 this group of patients is classified according to progress of infection in relation to age. Although it appears that the percentage of cured or improved is higher among the lower age groups, the numbers in the upper ages are too small for comparison.

If we classify those who were discharged as cured we find that the average period of treatment for those with minimal lesions was 12.6 months, whereas those with moderately advanced lesions were treated 17.1 months, and those with advanced lesions 19.5 months.

This study gives us a clear idea of

TABLE 8
Stage at Discharged Classified by Age

<i>Age</i>	<i>Cured</i>	<i>Per cent</i>	<i>Improved</i>	<i>Per cent</i>	<i>Unchanged</i>	<i>Per cent</i>	<i>Worse</i>	<i>Per cent</i>
Less 20	22	64.7	5	14.7	3	8.8	4	11.7
20-29	183	67.0	31	11.3	29	10.6	30	11.0
30-39	62	59.6	12	11.5	21	20.2	9	8.6
40-49	20	50.0	2	5.0	14	35.0	4	10.0
50 and over	2	20.0	0	5	50.0	3	30.0
Total	289		50		72		50	

In studying the care received we find that 81 per cent of those treated in a sanatorium showed improvement, as against 70 per cent of those treated at home. The difference is probably significant as sanatorium cases were selected from those with a less favorable prognosis. There is no difference between the percentages of men and women who showed improvement under treatment.

the economy in cost of treatment obtained by discovering cases in the early stages of the disease.

This report is only in the nature of a preliminary communication. It is an attempt to pause for a moment and take stock of what is being done with the hope that we may correct errors and direct our steps toward bringing about the best possible results.